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Review Article

A Review of Behavior Evaluation Scales in Pediatric Dentistry and Suggested Modification to the Frankl Scale

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Abstract

Aim: The purpose of this paper is to review and stress the importance of different behavior evaluation scales used in pediatric dentistry with more emphasis on the widely used Frankl scale, and to suggest a modification to the latter to clarify the gray area between the positive and negative ratings.

Background: One of the cornerstones in practicing pediatric dentistry is the ability to guide children positively throughout their dental experience and encourage positive dental attitude in order to improve their oral health. Anxiety associated with dental procedures can be reflected on the child's behavior. Therefore, it is important for pediatric dentists to be able to assess and evaluate psychological, personal traits and behavioral responses of the child in order to identify the need for modifications in the management approaches to reduce dental anxiety.

Review Results: This paper reviews the current literature concerning behavior evaluation scales used in pediatric dentistry. It includes MEDLINE database search and review of the comprehensive textbooks in pediatric dentistry. Some recommendations were based on the opinions of experienced researchers and clinicians.

Conclusions: The Frankl behavior scale, along with other scales, is highly useful in pediatric dentistry to assess the level of cooperativeness of the child during dental visits. A modification to the Frankl scale was suggested to add a fifth rating in order to make the scale more accurate and further reflective.

Clinical Significance: The need for more accurate scales had led to thinking about adding a new category to the Frankl scale. Once the child's behavior is assessed accurately, a clear planning for the ensuing visits could be achieved and behavioral management techniques are tailored to that specific child to help reduce the anxiety level.

Keywords: *Behavior Evaluation Scales; Behavioral Rating Scales; Frankl Scale; Likert Scale; Pediatric Dentistry*

Introduction

One of the cornerstones in practicing pediatric dentistry is the ability to guide children positively throughout their dental experience and encourage positive dental attitude in order to improve their oral health [1]. Anxiety associated with dental procedures can be reflected on the child's behavior. Therefore, it is important for pediatric dentists to be able to assess and evaluate psychological, personal traits and behavioral responses of the child in order to identify the need for modifications in the management approaches to reduce dental anxiety [2]. Several rating scales have been developed for evaluating child's behavior during dental visits. Evaluation of the child's behavior serves as an aid in directing individualized behavior guidance approach that facilitates dental treatment and provides a means for systematically recording behaviors for future appointments [1,3].

Venham (1980) suggested that any rating scale system should fulfill the requirements of being reliable, valid tool and has measurement properties. Scale reliability reveals to which extent the results are repeatable and constant. A reliable scale can be assessed when it provides same results at different times (test retest reliability) or by different raters (inter-observer agreement). A valid scale accurately measures what is intended to measure [4].

Methodology

This paper reviews the current literature concerning behavior evaluation scales in pediatric dentistry. It includes MEDLINE database search using key terms: "behavior evaluation scales", "behaviour evaluation scales", "behavioral rating scales", "Frankl scale", "Likert scale ", "pediatric dentistry". Articles were evaluated by title and/or abstract and relevance to behavior evaluation scales in pediatric dentistry. Twenty four citations were selected by this method and by the references within the chosen articles. A review of the comprehensive textbooks in pediatric dentistry was done. Some recommendations were based on the opinions of experienced researchers and clinicians.

Discussion

Several behavioral rating scales have been developed for classification of child's behavior during dental visits. One of the most commonly used behavioral rating scales in pediatric dentistry is the Frankel Rating Scale. It evaluates the child's attitude and cooperation during dental visits. The Frankel Rating Scale is divided into four categories ranging from definitely negative to definitely positive [5]. Global Rating Scale (GRS,1965) is another scale for behavioral assessment. It measures the overall behavior of the child at dental visits based on 5 points (5: excellent, 4: very good, 3: good, 2: fair, 1: poor) [6]. The Global Rating Scale is simple to use but it lacks elaboration of the actual child's behavior. Another scale, Visual Analogue Scale (VAS,1969) consists of 10 cm horizontal line that has two end points which represent the ultimate child's behavior: satisfactory and unsatisfactory. The pediatric dentist marks the child's behavior with a vertical line that crosses the horizontal line in either direction close to the representative end [7] (Figure 1).

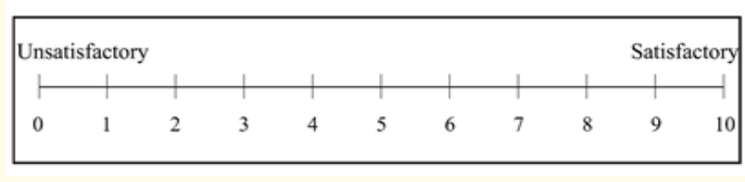

Figure 1: *Visual Analogue Scale (VAS, 1969).*

The Categorical Rating Scale developed by Nazif (1971) was used to assess four aspects of behavior: crying, cooperation, apprehension, and sleep [2] (Table 1).

Crying
1 = Screaming
2 = Continuous crying
3 = Mild, intermittent crying
4 = No crying
Cooperation
1 = Violently resists/disrupts treatment
2 = Movements which make treatment difficult
3 = Minor movement/intermittent
4 = No movement
Apprehension
1 = Hysterical/disobeys all instructions
2 = Extremely anxious/disobeys some/delays treatment
3 = Mildly anxious/complies with support
4 = Calm/relaxed/follows instructions
Sleep
1 = Fully awake
2 = Drowsy
3 = Asleep/intermittent
4 = Sound asleep

Table 1: *Categorical Rating Scale.*

Based on the child's cooperation, Wright (1975) classifies the child's behavior during dental visits into 3 classifications: cooperative, potentially cooperative and lack cooperation ability. A child is considered to be cooperative when s/he is generally relaxed and shows minimal apprehension during dental treatment. Some children lack cooperation ability such as those with disabling conditions or very young children unlike the potentially cooperative patients who have the ability to adjust to become cooperative children [1]. Wright also proposed an adjustment to the Frankl's behavior rating scale by adding - \ + for the corresponding categories.

Machen and Johnson (1991) described a new version of the Frankl's behavior rating scale in such that child's behavior assessed ranging from defiantly negative to defiantly positive at five different moments:

1. Separation of the child from the parent
2. First reaction of the child in dental setting
3. Attitude towards the dental staff
4. Behavior during treatment
5. Behavior after treatment [2].

Melamed., *et al*. (1978) developed the Behavior Profile Rating Scale (BPRS) which consists of 27 behavioral aspects during dental visits [8]. This scale was designed to allow an independent observer to record the frequency of the disruptive behavior during 3-minute observation periods (Table 2). Four of the items apply to behavior of the child upon separation of the mother, while the other 23 statements assess office behavior; 2 of them concern the dentist and the remaining 21 concern the behavior of the child. Each of the 27 behaviors is weighted by a factor that reflects the degree of its disruptiveness as defined by Melamed., *et al.* The total BPRS score is obtained by multiplying the frequency at which a behavior in each category occurs (across 3-min intervals) by its weighted factor. These weighted frequencies are then added across categories and the sum is divided by the number of 3-min intervals. In this way, the total BPRS score is a measure of the average frequency of fear-related behaviors per 3-min interval. Aartman., *et al.* stated that of the behavioral measures Melamed's BPRS is to be preferred to the Frankl's Behavior Rating Scale, Venham's and VAS. The main reason is that it measures the behavior of the child more precisely and that it has superior psychometric properties [9]. However, it can be a complicated score to calculate and takes a significant amount of time, also requires an external observer other than the treat¬ing dentist [10].

	Successive 3-min observation period						
	1	**2**	**3**	**4**	**5**	**6**	**Etc.**
Separation from mother							
(3) Cries							
(4) Clings to mother							
(4) Refuses to leave mother							
(5) Roddy carried in							
Office behavior							
(1) Inappropriate month closing							
(1) Choking							
(2) Won't sit hack							
(2) Attempts to dislodge instruments							
(2) Verbal complaints							
(2) Overreaction to pain							
(2) Whitt, knuckles							
(2) Negativism							
(2) Eyes closed							
(3) Cries at injection							
(3) Verbal message to terminate							
(3) Refuses Jo open mouth							
(3) Rigid posture							
(3) Crying							
(3) Dentist using loud yogi							
(4) Restraints used							
(4) Kicks							
(4) Stands up							
(4) Rolls over							
(5) Dislodges instruments							
(5) Refuses to sit in chair							
(5) Faints							
(5) Leaves chair							

Table 2: *Behavior Profile Rating Scale [9].*

Venham., *et al.* (1990) presented a 6-point behavioral Scale. This scale provides more details of positive and negative child's behavior. The scale ranges from total cooperation (0) to no cooperation (5) [4] (Table 3).

Rating	Definition
0	Total cooperation, best possible working conditions, no crying or physical protest.
1	Mild, soft verbal protest or (quiet) crying as a signal of discomfort, but does not obstruct progress. Appropriate behaviour for procedure, i.e., slight start at injection, "ow" during drilling if hurting, etc.
2	Protest more prominent. Both crying and hand signals. May move head around making it hard to 2 administer treatment. Protest more distracting and troublesome. However, child still complies with request to cooperate.
3	Protest presents real problem to dentist. Complies with demands reluctantly, requiring extra effort by dentist. Body movement.
4	Protest disrupts procedure, requires that all of the dentist's attention be directed toward the child's behaviour. Compliance eventually achieved after considerable effort by dentist, but without much actual physical restraint. (May require holding child's hands or the like to start). More prominent body movement.
5	General protest, no compliance or cooperation. Physical restraint is required.

Table 3: *Venham Behaviour Rating Scale.*

The facial Image Scale (FIS) was devel¬oped to assess the child's dental anxiety immediately before entering the dental clinic by using faces as an indicator of their feelings [11]. It consists of five faces in a raw ranging from happy face to sad face. The scale is scored by giving a value of one to the most positive face and five to the most negative face [12] (Figure 2).

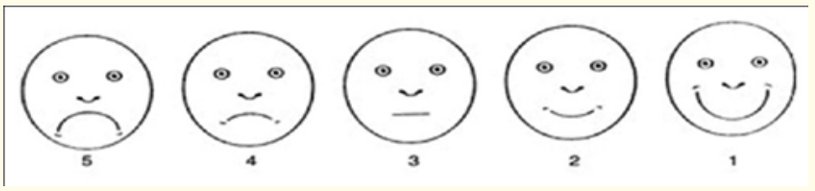

Figure 2: *The Facial Image Scale (FIS).*

A new version of the Facial Image Scale was developed and named Modified Child Dental Anxiety Scale (MCDAS). It is formed by adding a faces rating scale to the original numeric form. Modified Child Dental Anxiety Scale is considered to be a reliable and valid measure of dental anxiety in children aged 8 - 12 years [13,14] (Table 4).

Modified MCDASF How do you feel about					
1. Going to dentist generally	1	2	3	4	5
2. Having your teeth looked at	1	2	3	4	5
3. Having your teeth scraped and polished	1	2	3	4	5
4. Having an injection in the gum	1	2	3	4	5
5. Having a filling	1	2	3	4	5
6. Having a tooth taken out	1	2	3	4	5

Table 4: *Modified Child Dental Anxiety Scale (MCDAS) [14].*

Frankl., *et al.* (1962) developed a behavior rating scale in their study that aimed at evaluating the presence of parents in the dental operatory. Since then it became customary to be used in pediatric dentistry. The Frankl scale is commonly used by researchers to study the child's behavior toward different variables [15-17]. Also, comparison between Frankl scale and other behavior scales had been made [18]. The Frankl scale categorizes the child's behavior in the dental clinic into 4 categories starting from rating 1 (definitely negative) to rating 4 (definitely positive) [5] as follow:

- **Rating 1:** DEFINITLY NEGATIVE: refusal of treatment, crying forcefully, fearful, or any other overt evidence of extreme negativism.
- **Rating 2:** NEGATIVE: reluctant to accept treatment, uncooperative, some evidence of negative attitude but not pronounced i.e. sullen, withdrawn.
- **Rating 3:** POSITIVE: acceptance of treatment; at times caution. Willingness to comply with dentist, at time with reservation but patient follows the dentist's direction cooperatively.
- **Rating 4:** DEFINITLY Positive: good rapport with the dentist, interested in the dental procedure, laughing and enjoying the situation.

However, Al-Namankany., *et al* in their analysis of dental anxiety scales for children concluded that there is no gold standard for anxiety scales and further development is needed [10].

Likert (1932) had a lot of questions on the multiple methods that tend to measure subjects' attitude and whether they were reliable without any assumptions. Thus, he established the principle of attitude measurement through asking a series of statements about any topic. The Likert scale is an ordinal scale that involves five (or less commonly seven) points to rate the degree of agreement or disagreement with a statement. Therefore, by using Likert scale, a range of opinion can be obtained rather than a simple yes or no question [19,20]. A Likert-type scale assumes that the strength/intensity of an experience is linear, i.e. on a continuum and makes the assumption that attitudes can be measured.

It is well recognized in scientific research to quantify opinions or responses [21,22]. However, writing a statement or question could be challenging due to its effect on the subject response. Thus, the statement had to be written carefully [23]. Additionally, questionnaires that involve both adults and children should be designed appropriately in order to illicit useful information, especially from the younger subjects. Mellor and Moore found that children had some difficulties in using a number format compared to word format [24].

A new modification of the Frankel behavioral rating scale

Despite the fact that the Frankl scale in assessing behavior had been utilized for decades in pediatric dentistry and the fact that Wright had added to it in 1975 the symbols that made it even more popular; (--), (-), (+), and (++), the need for an additional category is justifiable. There is a gray area between rating 2 and 3. The new addition would be explained by borrowing the concept of the middle point in the Likert scale. That extra category could be express as (-+) leading to the suggested modified Frankl categories of behavior as follow:

- **Rating 1:** DEFINITLY NEGATIVE (--): Refusal of treatment, crying forcefully, fearful, or any other overt evidence of extreme negativism.
- **Rating 2:** NEGATIVE (-): Reluctant to accept treatment, uncooperative, some evidence of negative attitude but not pronounced, i.e. sullen, withdrawn.
- **Rating 3:** NEGATIVE POSITIVE (-+): Fluctuation between uncooperativeness and some evidence of unpronounced negative attitude, and cautious acceptance to treatment with reservation shifting throughout the visit.
- **Rating 4:** POSITIVE (+): Acceptance of treatment; at times cautious, willingness to comply with the dentist, at times with reservation but patient follows the dentist's directions cooperatively.
- **Rating 5:** DEFINITLY POSITIVE (++): Good rapport with the dentist, interested in the dental procedures, laughing and enjoying the situation.

Table 5 outlines the difference between the standard Frankl Scale and the suggested Modified Frankl Scale.

Rating 1: DEFINITLY NEGATIVE: Refusal of treatment, crying forcefully, fearful, or any other overt evidence of extreme negativism. **Rating 2:** NEGATIVE: Reluctant to accept treatment, uncooperative, some evidence of negative attitude but not pronounced i.e. sullen, withdrawn. **Rating 3:** POSITIVE: Acceptance of treatment; at times caution. Willingness to comply with dentist, at time with reservation but patient follows the dentist's direction cooperatively. **Rating 4:** DEFINITLY POSITIVE: good rapport with the dentist, interested in the dental procedure, laughing and enjoying the situation	**Rating 1:** DEFINITLY NEGATIVE (--) Refusal of treatment, crying forcefully, fearful, or any other overt evidence of extreme negativism. **Rating 2:** NEGATIVE (-) Reluctant to accept treatment, uncooperative, some evidence of negative attitude but not pronounced, i.e. sullen, withdrawn **Rating 3:** NEGATIVE POSITIVE (-+) Fluctuation between uncooperativeness and some evidence of unpronounced negative attitude, and cautious acceptance to treatment with reservation shifting throughout the visit. **Rating 4:** POSITIVE (+) Acceptance of treatment; at times cautious, willingness to comply with the dentist, at times with reservation but patient follows the dentist's directions cooperatively. **Rating 5:** DEFINITLY POSITIVE (++) Good rapport with the dentist, interested in the dental procedures, laughing and enjoying the situation.

Table 5: *Comparison between Frankl Scale (left) and the suggested Modified Frankl Scale (right).*

It is important to mention that many of those categories could be observed in a patient within the same dental visit; a child may have rating 4 (+) during taking radiograph, then rating 2(-) during administering local anesthesia to rating 5 (++) during treatment. Those ratings may change from one visit to another as well. When the behavior is assessed and entered in the progress notes of the chart, it is advisable that different behavior ratings in each visit are mentioned related to specific procedures or activities along with the non-pharmacological behavior management technique(s) used. An overall rating could be granted as the general behavior demonstrated by the child in that visit.

Conclusion

The Frankl behavior evaluation scale along with other scales is highly useful in pediatric dentistry to assess the level of cooperativeness of the child during dental visits. A modification to the Frankl scale was suggested to add a fifth rating in order to make the scale more accurate and further reflective.

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